Notice of Allowability	Application No.	Applicant(s)	
	10/045,007	BEER ET AL.	
	Examiner	Art Unit	
	Jason Mitchell	2193	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *remarks filed on 2/24/06*.

2. ☒ The allowed claim(s) is/are *1-4,6,7,9-16,18,20-28,30,31 and 33-36*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☑ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

DETAILED ACTION

The Declaration filed on 2/24/06 under 37 CFR 1.131 is sufficient to overcome the Esparza reference.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Ronni Jillions on 5/10/06.

1. A computer-implemented method for verifying software source code that includes references to program variables, the method comprising: processing the source code to derive a set of next-state functions, expressed with reference to a stack pointer associated with a stack used in running the code, and representing the control flow of the source code; replacing the references to the program variables in the source code with non-deterministic choice in the next-state functions; restricting the next-state functions including the non-deterministic choices, by limiting the stack pointer to a value no greater than a predetermined maximum, to produce a finite-state model of the control flow, wherein replacing the references to the program variables comprises

eliminating the references to the program variables from the next-state functions, so that the finite-state model is independent of data values of the program variables; and verifying the finite-state model to find an error in the source code.

2. (unchanged)

3. A method according to claim 2, ~~wherein processing the source code further comprises expressing the next-state functions with references to a stack pointer associated with a stack used in running the code, and~~ wherein replacing the program variables comprises eliminating all the references to the program variables from the next-state functions, leaving the next-state functions dependent on the program counter and on the stack pointer.

4. (canceled)

6-7, 9-12. (unchanged)

13. Apparatus for verifying software source code that includes references to program variables, the apparatus comprising a program analyzer, which is arranged to process the source code so as to derive a set of next-state functions, expressed with reference to a stack pointer associated with a stack used in running the code, and representing control flow of the source code; and to replace the references to the program variables

in the source code with non-deterministic choices in the next-state functions, and further to restrict the next-state functions including the non-deterministic choices, by limiting the stack pointer to a value no greater than a predetermined maximum, to produce a finite-state model of the control flow, which can be checked by a model checker to find an error in the source code, wherein the program analyzer is arranged to remove the references to the program variables from the next-state functions, so that the finite-state model is independent of data values of the program variables.

14. (unchanged)

15. Apparatus according to claim 14, wherein the program analyzer is further arranged ~~to express the next-state functions with reference to a stack pointer associated with a stack used in running the code, and~~ to eliminate all the references to the program variables from the next-state functions, leaving the next-state functions dependent on the program counter and on the stack pointer.

16. (canceled)

18, 20-24. (unchanged)

25. A computer software product for verifying source code that includes references to program variables, the product comprising a computer-readable medium in which

program instructions are stored, which instructions, when read by the computer, cause the computer to process the source code so as to derive a set of next-state functions, expressed with reference to a stack pointer associated with a stack used in running the code, and representing control flow of the source code; and to replace the references to the program variables in the source code with non-deterministic choice in the next-state functions, and further cause the computer to restrict the next-state functions including the non-deterministic choices, by limiting the stack pointer to a value no greater than a predetermined maximum, to produce a finite-state model of the control flow, which can be checked by a model checker to find an error in the source code, wherein the instructions cause the computer to remove the references to the program variables from the next-state functions, so that the finite-state model is independent of data values of the program variables.

26. (unchanged)

27. A product according to claim 26, wherein the instructions cause the computer ~~to express the next-state functions with reference to a stack pointer associated with a stack used in running the code, and~~ to eliminate all the references to the program variables from the next-state functions, leaving the next-state functions dependent on the program counter and on the stack pointer.

28. (canceled)

30-31, 33-36. (unchanged)

The following is a statement of reasons for the indication of allowable subject matter:

The cited prior art, taken alone or in combination, fails to teach the claimed invention of processing source code to derive a set of next-state functions representing control flow; replacing the references to the program variables in the source code with non-deterministic choices in the next-state functions; restricting the next-state functions by limiting the stack pointer to a value no greater than a predetermined maximum to produce a finite-state model of the control flow; wherein replacing the references to the program variables comprises eliminating the references to the program variables so that the finite-state model is independent of data values of the program variables; and verifying the finite-state model as recited in independent claim 1 and similarly recited in claims 13 and 25.

The closest prior art (US 5,481,717, Gaboury) discloses deriving a set of next-state functions representing control flow; restricting the next-state functions by limiting the stack pointer to a maximum value; but does not disclose or suggest replacing the references to program variables with non-deterministic choices such that the finite-state model is independent of data values of the program variables.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason Mitchell whose telephone number is (571) 272-3728. The examiner can normally be reached on Monday-Thursday and alternate Fridays 7:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kakali Chaki can be reached on (571) 272-3719. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jason Mitchell
5/4/06

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